

Appl. No. 10/009,676
Amdt. dated Oct. 26, 2004
Reply to Office Action of Sept. 30, 2004

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Amendment to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Original) A radiation source assembly for use with a fluid, comprising:
 - at least one radiation source adapted to be immersed in said fluid when the assembly is in use, the source producing radiation by excitation of a gas;
 - at least one excitation controlling means for controlling excitation of the gas within the radiation source, said excitation controlling means being adapted to be immersed in said fluid when the assembly is in use;
 - an elongate frame member having a portion adapted to be immersed in the fluid when the assembly is in use, the frame member being connected to at least one of the radiation source and the excitation controlling means; and
 - electrical conducting means for providing electrical energy to the excitation controlling means.
2. (Original) A radiation source assembly according to Claim 1 wherein the radiation source has electrodes and the excitation controlling means is a ballast electrically connected to the radiation source.
3. (Original) A radiation source assembly according to Claim 2 wherein the radiation source is a lamp for emitting ultraviolet radiation.
4. (Original) A radiation source assembly for use with a material selected from the group consisting of a liquid and a flowing fluid, comprising:
 - a) when the material is a liquid
 - at least one radiation source adapted to be immersed in said liquid when the assembly is in use;

Appl. No. 10/009,676
Amdt. dated Oct. 26, 2004
Reply to Office Action of Sept. 30, 2004

at least one excitation controlling means for controlling excitation of gas within the radiation source, said excitation controlling means being adapted to be immersed in said liquid when the assembly is in use;

and electrical conducting means for providing electrical energy to the excitation controlling means, or

b) when the material is a flowing fluid

at least one radiation source adapted to be immersed in said flowing fluid when the assembly is in use;

at least one excitation controlling means for controlling excitation of gas within the radiation source, said excitation controlling means being adapted to be immersed in said flowing fluid when the assembly is in use;

and electrical conducting means for providing electrical energy to the excitation controlling means.

5. (Original) A radiation source assembly according to Claim 4 wherein the radiation source is an ultraviolet lamp and the excitation controlling means is a ballast.

6. (Original) A radiation source assembly according to Claim 5 in which the assembly has an elongate frame member having a portion adapted to be immersed in the liquid or flowing fluid when the assembly is in use, and the frame member is connected to at least one of a) the ultraviolet lamp, b) an ultraviolet-transparent sleeve for the ultraviolet lamp and c) the ballast.

7. (Original) A radiation source assembly according to Claim 6 wherein the lamp is an electrodeless lamp and the excitation controlling means is a high frequency coupler.

8. (Original) A radiation source assembly according to Claim 6 wherein the radiation source is an ultraviolet lamp with electrodes and the excitation controlling means is a ballast electrically connected to the lamp.

Appl. No. 10/009,676
Amdt. dated Oct. 26, 2004
Reply to Office Action of Sept. 30, 2004

9. (Original) A radiation source assembly according to Claim 8 wherein the ultraviolet lamp is adjacent to the ballast.

10. (Original) A radiation source assembly according to Claim 9 wherein the ballast is supported by said elongate frame member.

11. (Original) A radiation source assembly according to Claim 10 wherein, when the material is a liquid, the ballast is elongate and has first and second opposed ends, the first end of which is mounted on a portion of the first elongate frame member which is to be immersed in the liquid, the lamp is elongate and has first and second opposed ends, the first end of which is connected to the second end of the ballast.

12. (Original) A radiation source assembly according to Claim 5 wherein the electrical conducting means includes, for each excitation controlling means, an electrical wire which extends from the excitation controlling means to a location which is not immersed in the liquid or flowing fluid.

13. (Original) A radiation source assembly according to Claim 11 wherein the assembly has a further elongate frame member, and the second end of each associated lamp is supported by said further elongate frame member.

14. (Original) A radiation source assembly according to Claim 11 wherein the first elongate frame member is tubular with an outer wall and wherein there is, for each ballast, a support with an externally threaded tubular stub surrounding an access aperture through the outer wall, the ballast having an external retaining ring fixed adjacent the first end thereof, the assembly further comprising an internally threaded coupling for engaging the stub and the retaining ring, so as to move the stub and the ring toward each other, and a resilient sealing member between the stub and the coupling such that the retaining ring is pressed against the exterior of the excitation controlling means when the coupling is tightened.

Appl. No. 10/009,676
Amdt. dated Oct. 26, 2004
Reply to Office Action of Sept. 30, 2004

15. (Original) A radiation source assembly according to Claim 11 wherein the assembly has a sleeve surrounding each radiation source, said sleeve having one open end and one closed end and being made of a material transparent to radiation emitted by the radiation source, and a further coupling which sealingly supports the open end of said sleeve from the second end of the excitation controlling means.

16. (Original) A radiation source assembly for use in a photochemical treatment of a fluid comprising:

at least one radiation source for producing radiation by excitation of a gas;

at least one excitation controlling means adapted to be immersed in said fluid when the assembly is in use, for controlling excitation of the gas within the radiation source;

a submersible frame member having a portion adapted to be immersed in the fluid when the assembly is in use and having a plurality of supports, each support providing support for at least one of a) a radiation source, b) a radiation-transparent sleeve for the radiation source and c) an excitation controlling means; and

electrical conducting means for providing electrical energy to the excitation controlling means.

17. (Original) A radiation source assembly according to Claim 16 for treatment of a liquid wherein the assembly is selected from the group consisting of

A) an assembly in which the excitation controlling means is a ballast, said ballast having a second end opposed to a first end, and said ballast having an outer sleeve which encloses components of the ballast, the sleeve being sealed to prevent ingress of liquid into the ballast, said ballast and support having connection means for mechanically connecting the first end of the ballast to the support;

Appl. No. 10/009,676
Amdt. dated Oct. 26, 2004
Reply to Office Action of Sept. 30, 2004

the radiation source is an elongate ultraviolet lamp having first and second opposed ends, said lamp and ballast having connection means for mechanically and electrically connecting the first end of the lamp to the second end of the ballast; and

and the assembly has means for sealing the lamp against direct contact with the liquid;

B) an assembly in which the radiation source is an elongate ultraviolet lamp having connection means for mechanically connecting the lamp to the support;

the excitation controlling means is a ballast, said lamp and ballast having means for electrically connecting them together; and

the assembly has sealing means for sealing the lamp and ballast against direct contact with the liquid ;

C) an assembly in which the radiation source is an elongate ultraviolet lamp;

the excitation controlling means is a ballast, said lamp and ballast having means for electrically connecting them together;

and the assembly has a sleeve covering and sealing the lamp and ballast against direct contact with the liquid, and the assembly has connection means for mechanically connecting the sleeve means to the support; and

D) an assembly in which the excitation controlling means is a ballast, having an outer sleeve which encloses components of the ballast, the sleeve being sealed to prevent ingress of liquid into the ballast, said ballast having connection means for mechanically connecting the ballast to the support;

the radiation source is an elongate ultraviolet lamp having connection means for mechanically connecting the lamp to the support separately from the ballast, and means for sealing the lamp against direct contact with the liquid, said lamp and ballast having means for electrically connecting them together.

Appl. No. 10/009,676
Amdt. dated Oct. 26, 2004
Reply to Office Action of Sept. 30, 2004

18. (Original) A radiation source assembly according to Claim 16 wherein the tubular elongate frame member contains electrical power transmission means and the ballast is removably coupled, electrically, to the power transmission means.

19. (Original) A radiation source assembly according to Claim 16 wherein each radiation source is an ultraviolet lamp, each excitation controlling means is a ballast, each lamp has an ultraviolet transparent sleeve and there is a screw coupling with a liquid tight seal between the lamp, sleeve and ballast.

20. (Withdrawn) A process for treating liquids with ultraviolet light comprising passing the liquid over an ultraviolet lamp and ballast assembly which is submerged in the liquid.

21. (Withdrawn) A means for transmission of electrical power and electrical signals, in form of a laminate which comprises:
a plurality of elongated electrically conducting members, each with a plurality of connectors at spaced apart intervals along the member, said electrically conducting members having an electrically insulating material between the members.

22. (Withdrawn) A means for transmission of electrical power and electrical signals according to Claim 21 wherein each electrically conducting member is sandwiched between two electrically insulating strips, and at least one of the strips has notches at spaced apart intervals along the strip, wherein the connectors are housed in the notches.

23. (Withdrawn) A means for transmission of electrical power and electrical signals according to Claim 21 which has first and second elongated electrically conducting members, said first electrically conducting member being sandwiched between first and second electrically insulating members and said

Appl. No. 10/009,676
Amdt. dated Oct. 26, 2004
Reply to Office Action of Sept. 30, 2004

second electrically conducting member being sandwiched between second and third electrically insulating members.

24. (Withdrawn) A means for transmission of electrical power and electrical signals according to Claim 21 wherein the connectors are spring clip connectors for connecting with electrically conducting pins.

25. (Withdrawn) A means for transmission of electrical power and electrical signals according to Claim 21 wherein each outer electrically insulating member is clad with a further electrically insulating member.

26. (Previously Presented) A radiation source module comprising:
a frame having a first support member;
at least one radiation source assembly extending from and in engagement with the first support member;
a radiation source disposed in the radiation source assembly;
connection means for affixing the radiation source module in a fluid treatment system; and
a power supply connected to the frame and configured to be in contact with a fluid.

27. (Previously Presented) The radiation source module defined in claim 26, wherein the fluid comprises fluid being treated.

28. (Previously Presented) The radiation source module defined in claim 26, wherein the fluid comprises a cooling liquid.

29. (Previously Presented) The radiation source module defined in claim 28, further comprising a container for the cooling liquid.

30. (Previously Presented) The radiation source module defined in claim 29, wherein the container is remote from the module.

Appl. No. 10/009,676
Amdt. dated Oct. 26, 2004
Reply to Office Action of Sept. 30, 2004

31. (Previously Presented) The radiation source module defined in claim 29, wherein the container is attached to the module.

32. (Previously Presented) The radiation source module defined in claim 31, wherein a portion of the container comprising the cooling liquid is submersible in the fluid being treated.

33. (Previously Presented) The radiation source module defined in claim 26, wherein the power supply is configured to be fully submersible in a fluid being treated.

34. (Previously Presented) The radiation source module defined in claim 26, wherein at least one radiation source assembly is cantilevered from the first support member.

35. (Previously Presented) The radiation source module defined in claim 26, wherein the power supply is interposed between the support member and the radiation source.

36. (Previously Presented) The radiation source module defined in claim 26, wherein an individual power supply is provided for each radiation source in the module.

37. (Previously Presented) The radiation source module defined in claim 26, wherein an individual power supply is provided for each pair of radiation sources in the radiation source assembly.

38. (Previously Presented) The radiation source module defined in claim 26, wherein an individual power supply is provided for a plurality of radiation sources in the radiation source assembly.

Appl. No. 10/009,676
Amdt. dated Oct. 26, 2004
Reply to Office Action of Sept. 30, 2004

39. (Previously Presented) The radiation source module defined in claim 26, wherein the power supply is connected to the connection means and a portion of the power supply is configured to be immersed in a fluid.

40. (Previously Presented) The radiation source module defined in claim 26, wherein the frame comprises a second support member and the radiation source assembly is supported at its opposed ends by the first support member and the second support member.

41. (Previously Presented) The radiation source module defined in claim 40, the frame comprises a third support member interconnecting the first support member and the second support member.

42. (Previously Presented) The radiation source module defined in claim 26, wherein the power supply is disposed within a portion of the frame.

43. (Previously Presented) The radiation source module defined in claim 26, wherein the power supply is connected to an exterior of the frame.

44. (Previously Presented) A fluid treatment system comprising a radiation source module defined in claim 26.

45. (Previously Presented) A radiation source module comprising:
a frame having a first support member;
at least one radiation source assembly extending from and in engagement with the first support member;
a radiation source disposed in the radiation source assembly;
connection means for affixing the radiation source module in a fluid treatment system; and
a power supply connected to the frame and configured to be in contact with a fluid, wherein a portion of the power supply is configured to contact a dielectric cooling liquid.